

Claims

1. An image sensor for sensing a received image, comprising:
a substrate;
a photo TFT disposed on the substrate to generate a photocurrent responsive to the received image, the photo TFT including,
a source electrode coupled to a first bias line,
a gate electrode coupled to a second bias line,
a drain electrode, and
a semiconductor layer coupled to the source and drain electrodes; and
a storage capacitor disposed on the substrate and coupled to the source electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.
2. The image sensor of claim 1 wherein the source electrode and the drain electrode of the photo TFT each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.
3. The image sensor of claim 1, further comprising:
a readout TFT disposed on the substrate and including,
a gate electrode coupled to a select line,
a source electrode coupled to the drain electrode of the photo TFT,
a drain electrode coupled to a data line, and
a semiconductor layer coupled to the source and drain electrodes.
4. The image sensor of claim 3 further comprising:
a passivation layer disposed on the photo TFT and the readout TFT; and
a light shield disposed on the passivation layer substantially above the readout TFT.
5. The image sensor of claim 1 wherein the storage capacitor comprises a stacked capacitor.
6. The image sensor of claim 1 wherein the semiconductor layer includes a n+ layer in contact with the source and drain electrodes.
7. The image sensor of claim 1 wherein the semiconductor layer of the photo TFT includes amorphous silicon.

8. The image sensor of claim 1 wherein the photo TFT includes a gate insulator disposed between the respective gate electrode and semiconductor layer and preventing contact between the gate electrode and the semiconductor layer.

9. The image sensor of claim 1 wherein the gate electrode is selected from a group consisting of Cu, Cr, Al, Ta, and Ti.

10. The image sensor of claim 1 further comprising a passivation layer disposed on the photo TFT.

11. The image sensor of claim 10 wherein the passivation layer is selected from the group consisting of silicon nitride, silicon oxide, and tantalum oxide.

12. The image sensor of claim 1 further comprising a screen disposed adjacent the photo TFT to convert received x-rays to visible light.

13. An image sensor for sensing a received image, comprising:
a substrate;
a photo TFT disposed on the substrate to generate a photocurrent responsive to the received image, the photo TFT including,
a source electrode coupled to a select line corresponding to an adjacent image sensor,
a gate electrode coupled to a bias line,
a drain electrode, and
a semiconductor layer coupled to the source and drain electrodes; and
a storage capacitor disposed on the substrate and coupled to the gate electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.

14. The image sensor of claim 13 wherein the source electrode and the drain electrode of the photo TFT each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

15. The image sensor of claim 13, further comprising:
a readout TFT disposed on the substrate and including,
a gate electrode coupled to a second select line,
a source electrode coupled to the drain electrode of the photo TFT,
a drain electrode coupled to a data line, and
a semiconductor layer coupled to the source and drain electrodes.

16. The image sensor of claim 15 further comprising:

a passivation layer disposed on the photo TFT and the readout TFT; and
a light shield disposed on the passivation layer substantially above the
readout TFT.

17. The image sensor of claim 13 wherein the storage capacitor comprises a
stacked capacitor.

18. The image sensor of claim 13 wherein the semiconductor layer includes a
n⁺ layer in contact with the source and drain electrodes.

19. The image sensor of claim 13 wherein the semiconductor layer of the
photo TFT includes amorphous silicon.

20. The image sensor of claim 13 wherein the photo TFT includes a gate
insulator disposed between the respective gate electrode and semiconductor layer
and preventing contact between the gate electrode and the semiconductor layer.

21. The image sensor of claim 13 wherein the gate electrode is selected from
a group consisting of Cu, Cr, Al, Ta, and Ti.

22. The image sensor of claim 13 further comprising a passivation layer
disposed on the photo TFT.

23. The image sensor of claim 22 wherein the passivation layer is selected
from the group consisting of silicon nitride, silicon oxide, and tantalum oxide.

24. The image sensor of claim 13 further comprising a screen disposed
adjacent the photo TFT to convert received x-rays to visible light.

25. An image sensor array for sensing a received image, comprising:
a substrate;
a plurality of bias lines disposed on the substrate;
a plurality of data lines disposed on the substrate;
a plurality of select lines disposed on the substrate;
a plurality of photo TFTs disposed on the substrate to generate a photocurrent
responsive to the received image, each photo TFT including,
a source electrode coupled to a corresponding first bias line,
a gate electrode coupled to a corresponding second bias line to
provide a bias to the gate electrode independent of the bias to the source
electrode,
a drain electrode, and
a semiconductor layer coupled to the source and drain electrodes;

a plurality of storage capacitors disposed on the substrate, each storage capacitor coupled to the source electrode and drain electrode of a corresponding photo TFT, each storage capacitor storing a charge generated by a photocurrent; and

a plurality of readout TFTs disposed on the substrate, each readout TFT including,

a gate electrode coupled to a corresponding select line,

a source electrode coupled to the drain electrode of a corresponding photo TFT and coupled to the storage capacitor,

a drain electrode coupled to a corresponding data line, and

a semiconductor layer coupled to the source and drain electrodes,

wherein each readout TFT passes a current to a corresponding data line in response to the discharge of a corresponding storage capacitor.

26. The image sensor array of claim 25 wherein the source electrode and the drain electrode of the photo TFTs each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

27. The image sensor array of claim 25 wherein the semiconductor layers of each photo TFT and readout TFT include amorphous silicon.

28. The image sensor array of claim 25 wherein each storage capacitor includes a stacked capacitor.

29. The image sensor array of claim 25 wherein each photo TFT and readout TFT includes a gate insulator disposed between the respective gate electrode and semiconductor layer and preventing contact between the gate electrode and the semiconductor layer.

30. The image sensor array of claim 25 further comprising a passivation layer disposed on each photo TFT and readout TFT.

31. The image sensor array of claim 30 further comprising a plurality of light shields disposed on the passivation layer substantially above a corresponding readout TFT.

32. The image sensor array of claim 25 further comprising a screen disposed adjacent to the photo TFTs to convert received x-rays to visible light.

33. An image sensor array for sensing a received image, comprising:
a substrate;

a plurality of bias lines disposed on the substrate;
a plurality of data lines disposed on the substrate;
a plurality of select lines disposed on the substrate;
a plurality of photo TFTs disposed on the substrate to generate a photocurrent responsive to the received image, each photo TFT including,
 a source electrode coupled to a select line corresponding to an adjacent readout TFT,
 a gate electrode coupled to a corresponding bias line,
 a drain electrode, and
 a semiconductor layer coupled to the source and drain electrodes;
a plurality of storage capacitors disposed on the substrate, each storage capacitor coupled to the corresponding bias line and to the drain electrode of a corresponding photo TFT, each storage capacitor storing a charge generated by a photocurrent; and
a plurality of readout TFTs disposed on the substrate, each readout TFT including,
 a gate electrode coupled to a corresponding select line,
 a source electrode coupled to the drain electrode of a corresponding photo TFT and coupled to the storage capacitor,
 a drain electrode coupled to a corresponding data line, and
 a semiconductor layer coupled to the source and drain electrodes,
wherein each readout TFT passes a current to a corresponding data line in response to the discharge of a corresponding storage capacitor.

34. The image sensor array of claim 33 wherein the source electrode and the drain electrode of the photo TFTs each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

35. The image sensor array of claim 33 wherein the semiconductor layers of each photo TFT and readout TFT include amorphous silicon.

36. The image sensor array of claim 33 wherein the storage capacitors include a stacked capacitor.

37. The image sensor array of claim 33 wherein each photo TFT and readout TFT includes a gate insulator disposed between the respective gate electrode and

semiconductor layer and preventing contact between the gate electrode and the semiconductor layer.

38. The image sensor array of claim 33 further comprising a passivation layer disposed on each photo TFT and readout TFT.

39. The image sensor array of claim 38 further comprising a plurality of light shields disposed on the passivation layer substantially above a corresponding readout TFT.

40. The image sensor array of claim 33 further comprising a screen disposed adjacent to the photo TFTs to convert received x-rays to visible light.

41. An image sensor for sensing a received image, comprising:

a substrate;

a photo TFT to generate a photocurrent responsive to the received image, the photo TFT including,

a gate electrode,

a source electrode coupled to the gate electrode,

a drain electrode, and

a semiconductor layer coupled to the source and drain electrodes; and

a storage capacitor disposed between the substrate and the photo TFT and coupled to the source electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.

42. The image sensor of claim 41 wherein the storage capacitor includes top and bottom electrodes and wherein the gate electrode of the photo TFT is the top electrode of the storage capacitor.

43. The image sensor of claim 41 wherein the storage capacitor comprises a stacked capacitor.

44. The image sensor of claim 41 wherein the source electrode and the drain electrode of the photo TFT each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

45. The image sensor of claim 41, further comprising:

a readout TFT disposed on the substrate, including,

a gate electrode coupled to a select line,

a source electrode coupled to the drain electrode of the photo TFT,

a drain electrode coupled to a data line, and

a semiconductor layer coupled to the source and drain electrodes.

46. An image sensor for sensing received image, comprising:

a substrate;

a photo TFT to generate a photocurrent responsive to the received image, the photo TFT including,

a gate electrode,

a source electrode,

a drain electrode coupled to the gate electrode, and

a semiconductor layer coupled to the source and drain electrodes; and

a storage capacitor disposed between the substrate and the photo TFT and coupled to the source electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.

47. The image sensor of claim 46 wherein the storage capacitor includes top and bottom electrodes and wherein the gate electrode of the photo TFT is the top electrode of the storage capacitor.

48. The image sensor of claim 46 wherein the storage capacitor comprises a stacked capacitor.

49. The image sensor of claim 46 wherein the source electrode and the drain electrode of the photo TFT each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

50. The image sensor of claim 46, further comprising:

a readout TFT disposed on the substrate, including,

a gate electrode coupled to a select line,

a source electrode coupled to the drain electrode of the photo TFT,

a drain electrode coupled to a data line, and

a semiconductor layer coupled to the source and drain electrodes.

51. An image sensor for sensing received image, comprising:

a substrate;

a photo TFT to generate a photocurrent responsive to the received image, the photo TFT including,

a gate electrode,

a source electrode coupled to the gate electrode,

a drain electrode, and

a semiconductor layer coupled to the source and drain electrodes;
a reference TFT disposed coplanar with the photo TFT and coupled to the photo TFT, the reference TFT having dimensions substantially similar to the photo TFT and providing a compensating dark current, the reference TFT including,

a gate electrode,

a source electrode coupled to the gate electrode,

a drain electrode, and

a semiconductor layer coupled to the source and drain electrodes; and

a storage capacitor disposed between the substrate and the photo TFT and coupled to the source electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.

52. The image sensor of claim 51 wherein the storage capacitor includes top and bottom electrodes and wherein the gate electrode of the photo TFT is the top electrode of the storage capacitor.

53. The image sensor of claim 51 wherein the storage capacitor comprises a stacked capacitor.

54. The image sensor of claim 51 wherein the source electrode and the drain electrode of the photo TFT and the reference TFT each include an extending member, the extending member of the source electrode interdigitated with the extending member of the drain electrode.

55. The image sensor of claim 51, further comprising:

a readout TFT disposed on the substrate, including,

a gate electrode coupled to a select line,

a source electrode coupled to the drain electrode of the photo TFT,

a drain electrode coupled to a data line, and

a semiconductor layer coupled to the source and drain electrodes.

56. An image sensor for sensing a received image, comprising:

a substrate;

a photo TFT to generate a photocurrent responsive to the received image, the photo TFT including,

a source electrode coupled to a first bias line,

a gate electrode coupled to a second bias line,

a drain electrode, and

a semiconductor layer coupled to the source and drain electrodes; and

a storage capacitor disposed between the substrate and the photo TFT and coupled to the source electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.

57. The image sensor of claim 56 wherein the storage capacitor includes top and bottom electrodes and wherein the gate electrode of the photo TFT is the top electrode of the storage capacitor.

58. The image sensor of claim 56 wherein the source electrode and the drain electrode of the photo TFT each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

59. The image sensor of claim 56 further comprising:

a readout TFT disposed on the substrate and including,

a gate electrode coupled to a select line,

a source electrode coupled to the drain electrode of the photo TFT,

a drain electrode coupled to a data line, and

a semiconductor layer coupled to the source and drain electrodes.

60. The image sensor of claim 56 wherein the storage capacitor comprises a stacked capacitor.

61. An image sensor for sensing a received image, comprising:

a substrate;

a photo TFT to generate a photocurrent responsive to the received image, the photo TFT including,

a source electrode coupled to a select line corresponding to an adjacent image sensor,

a gate electrode coupled to a bias line,

a drain electrode, and

a semiconductor layer coupled to the source and drain electrodes; and

a storage capacitor disposed between the substrate and the photo TFT and coupled to the gate electrode and drain electrode of the photo TFT, the storage capacitor storing a charge generated by the photocurrent.

62. The image sensor of claim 61 wherein the storage capacitor includes top and bottom electrodes and wherein the gate electrode of the photo TFT is the top electrode of the storage capacitor.

63. The image sensor of claim 61 wherein the source electrode and the drain electrode of the photo TFT each include a plurality of extending members, the extending members of the source electrode interdigitated with the extending members of the drain electrode.

64. The image sensor of claim 61, further comprising:
a readout TFT disposed on the substrate and including,
a gate electrode coupled to a second select line,
a source electrode coupled to the drain electrode of the photo TFT,
a drain electrode coupled to a data line, and
a semiconductor layer coupled to the source and drain electrodes.

65. The image sensor of claim 61 wherein the storage capacitor comprises a stacked capacitor.